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ABSTRACT

Involving 619 preschool children, a longitudinal investigation evaluated a new test for identifying preschool children who produce an excessive number of form errors in printing. All children participating were fluent in English and were in the appropriate grades for their ages, either pre-kindergarten or kindergarten, when they were given the Printing Performance School Readiness Test (PPSRT). Follow-up data were collected for 1 to 3 years. Two independent sets of measures were employed as criteria for subsequent academic achievement: indicators of children's classroom performance and scores on several standardized instruments administered in pre-kindergarten, kindergarten, or first grade. Results show that the PPSRT can be reliably scored, that it generates performance at the preschool level which remains quite stable over a fairly long period of time, and that this preschool performance is closely tied to later achievement in each of the major areas of the elementary school curriculum. Additional findings indicate that whether or not form errors occur depends to a considerable extent on the nature of the printing task itself. Form errors may result not from perceptual/motor difficulties, but may be due to the combined effects of momentary lapses in attention to detail and lack of familiarity with letters and numbers, two characteristics linked to poor performance in school. (RH)

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Paper presented at the 2nd International Symposium on the Neural and Motor Aspects of Handwriting, Hong Kong, July, 1985.

An Evaluation of a New Printing Instrument to Aid in Identifying the Failure-prone Preschool Child

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Abstract

Although largely neglected in the past, recent work has shown that form errors in printing, at the preschool level, can be an extremely important early warning sign of later school failure. This report contains further evidence from a longitudinal investigation which was undertaken to evaluate a new test for identifying preschool children who produce an excessive number of these errors.

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When young children print it is not uncommon to find a backward '3' occasionally drawn in place of the letter S or the capital letter E containing four or more horizontal lines. Such errors are often called "form errors" because they involve the addition, omission, and/or misalignment of parts leading to a marked distortion in the overall shape or form of the intended letter or number (for other examples see Figure 1). Although errors of this type have generated considerable interest for many years among investigators working with older children or adults, except for those who have been concerned primarily with the development of instructional techniques that could be used to help improve the legibility of the preschool child's printing (e.g., Furner, 1983; Staats, 1971) these errors have received little attention among people working at the preschool level.

As an outgrowth of a series of investigations focusing on various aspects of young children's printing (Simner, 1979, 1981, 1982, 1984a, 1984b) we discovered, however, that form errors at the preschool level are far more important than previously thought and that they deserve serious study in their own right. Specifically, we found that when an excessive number of these errors appears in samples of printing obtained from four to six year old children, this can be an extremely important early warning sign of later school failure (Simner, 1982). Using procedures derived from this previous work we then designed the Printing Performance School Readiness Test (PPSRT) to provide a standardized means for identifying preschool children who exhibit this warning sign (Simner, 1985). The manual that accompanies this test contains the initial findings from a longitudinal investigation undertaken several years ago to evaluate this instrument. The major purpose of this report is to update these findings by presenting additional data from a further stage in this investigation.

PLACE FIGURE 1 ABOUT HERE

Subjects

Six hundred and nineteen non-repeating preschool children distributed among six different samples were obtained from public elementary schools situated in lower and middle income areas of London, Ontario, an urban center with a population of 275,000 people. Interviews conducted with a representative sample of 94 parents showed that the occupations of the parents of the children in this investigation ranged from laborer, construction worker, and custodian, through appliance technician, crane operator, and store manager, to school teacher,

physician, and university professor. According to the Blishen (1967) scale for Canadian occupations the mean socio-economic index for this sample of parents as a whole was 38 on a scale that ranges from 25 to 76. In addition, although approximately 10-15% of the children who participated in this study came from bilingual backgrounds, all were fluent in English and, furthermore, all were in the appropriate grades for their ages (either pre-kindergarten or kindergarten) at the time they were given the PPSRT.

Sample Composition

Sample 1 contained 81 pre-kindergarten children (42 male, 39 female). Thirty-five of these children were tested in May/June 1980 while the rest were tested in May/June 1981. Sample 2 consisted of 69 pre-kindergarten children (38 male, 31 female) tested in May/June 1983 while Sample 3 was composed of 133 pre-kindergarten children (74 male, 59 female) tested in May/June, 1984. The mean age for all of the children in Samples 1, 2, and 3 at the time of testing was four years, 10 months.

Sample 4, consisting of 118 kindergarten children (62 male, 56 female), was tested in October/November 1980. This sample also included 25 children from Sample 1. In addition, 110 of the children in Sample 4 were re-tested a second time along with 10 new children at the end of the kindergarten year (May/June 1981). Sample 5, containing 132 kindergarten children (66 male, 66 female) was tested initially in October/November 1982. We also re-tested 105 of these children in May/June 1983 along with six other new kindergarten children.

Finally, Sample 6 was composed of 95 kindergarten children (40 male, 55 female) made up of two separate groups. The first group of 31 children was tested in October/November 1979 while the second group of 64 children was tested in May/June 1980. The decision to combine these two groups into one sample, despite the fact that they were tested at different times of the year, stemmed from the steady decline in group size that took place during the follow-up period. Prior to combining these two groups, though, we converted the actual form error scores obtained by the children in each group to z-score values to compensate for changes that normally take place in the number of form errors produced throughout the kindergarten year (Simner, 1982). The mean age of the children in Samples 4, 5, and 6 who were tested in October/November of kindergarten was five years, three months whereas the mean age for those tested in May/June of kindergarten was five years, 11 months.

Method

PPSRT Testing Procedure

Following the guidelines in the PPSRT manual each child, tested individually, was shown 41 letters and numbers presented one at a time on white cards held in a spiral binder. Figure 2 shows the location of a tester, a child, and the spiral binder during testing. As mentioned above, testing took place either in the late spring of pre-kindergarten, the fall of kindergarten, or in the late spring of kindergarten. When testing occurred in kindergarten the children were required to print from memory immediately after seeing each letter or number for two to three seconds. This was accomplished by having the tester

turn the card containing the letter thereby exposing the child to a blank white card and then asking the child to print the letter from memory. At the pre-kindergarten level the children merely copied the letters and numbers from the cards while these remained in full view. For both conditions total test time averaged about 10 minutes per child. After testing the protocols were scored for the presence of form errors using the detailed instructions that also are given in the manual.

PLACE FIGURE 2 ABOUT HERE

Interscorer Reliability

Fifteen university undergraduate students were asked to score the same 20 randomly selected protocols according to the instructions in the PPSRT manual. The resulting interscorer reliability correlation matrix appears in Table 1. In line with the evidence reported in the manual, both the magnitude and the consistency of the correlations in this table clearly indicate the very high level of agreement that occurs when different people judge the overall number of form errors on protocols generated by this test.

PLACE TABLE 1 ABOUT HERE

Follow-Up Procedures

The children in each sample were followed for periods that ranged from one to three years. While every effort was made to locate all of the children as they progressed through school, budget restrictions prevented us from visiting schools more than once and from gathering information on children who moved to school districts outside of London. In addition, we did not obtain follow-up data on children who transferred from the original public schools to denominational schools or to foreign language schools since the differences in curriculum that characterized these other schools, by itself, could have affected the children's performance on the various criteria discussed below. Although the children who eventually were lost from our investigation for these reasons represented approximately 20% of the total sample, it is important to note that the overall mean PPSRT score for these children was almost identical to the mean PPSRT score for the children who remained throughout the follow-up work. For example, the mean PPSRT score for the 22 children in Sample 4 who were tested in the fall of kindergarten and who moved was 15.4 while the mean score for the 87 children in this sample who remained in the study through grade 2 was 14.9. Therefore, since both groups were quite similar at the outset, it would seem that this loss of children which resulted from a change in address probably had little impact on the correlations reported for the various measures discussed below.

Unfortunately a similar conclusion is not justified in the case of those children who were eliminated from our follow-up work due to school failure.

Specifically, once a child failed we were no longer able to collect meaningful achievement data beyond the grade in which failure took place since grade repetition, of course, entails exposure to material which clearly would have affected the children's performance on our criterion measures. Although only about 5 to 10% of the children in the various samples were lost for this reason, the mean PPSRT score for these children was far higher than the mean score for the group of children that remained in our investigation. (In the case of the Sample 4 children referred to above, the mean PPSRT score for the nine children who eventually failed either kindergarten or grade 1 was 27.4.) This difference in performance on the PPSRT is quite important in relation to the correlational findings reported below, since the loss of these children served to reduce the range of individual differences in PPSRT scores among the children who remained throughout the follow-up work and it is well known that such a reduction in range tends to lower the magnitude of any resulting correlations (Anastasi, 1982). Also, the number of children in this failing group became progressively greater with each succeeding school year. For example, of the 12 children in Sample 1 who eventually failed, none repeated pre-kindergarten whereas two failed kindergarten and 10 were retained in grade 1. Hence, it should be kept in mind that the long term follow-up results reported in Table 2, especially for grade 2, probably underestimate the actual strength of the association between the children's initial scores on the PPSRT and the children's subsequent performance in school due to the progressive loss from our sample of these high scoring at-risk children.

School Achievement Criteria

Two independent sets of measures were employed as criteria of subsequent academic achievement. The first set consisted of the children's scores on the following standardized instruments administered either in pre-kindergarten, kindergarten, or 1st grade: the Wide Range Achievement Test (WRAT) by Jastak and Jastak (1976, Level-1); the alphabet knowledge, number knowledge, and relational concept subtests contained in Lesiak's (1978) Developmental Tasks for Kindergarten Readiness (DTKR); the word identification subtest from the Woodcock Reading Mastery Tests (WRMT) by Woodcock (1974, Form-B); and the addition, subtraction, numerical reasoning, word problem, and time subtests from the Keymath Diagnostic Arithmetic Test (KDAT) by Connolly, Nachtman, and Pritchett (1971). In addition, two teachers provided us with the scores obtained by the children in their classes on the Metropolitan Readiness Test (MRT) by Hildreth, Griffiths, and McGauvran (1969) and on the Metropolitan Achievement Test (MAT) by Durost, Bixler, Wrightstone, Prescott, and Barlow (1971).

The second set of criteria was based on the children's classroom performance. At the end of both pre-kindergarten and kindergarten each child's class standing was obtained from the promotion lists prepared by the children's teachers using a 12 point rating scale with values that ranged from D- to A+. The information on these lists reflects the children's degree of mastery of the core curriculum objectives established by the Board of Education and, hence, the teachers' judgements of the children's overall readiness for promotion to the next grade. For those children followed through grades 1 and 2 we obtained the children's final report card marks issued in June, which also ranged from D- to A+, in the major subject areas of reading, written composition, and arithmetic. To determine the overall class standing for these children, we then calculated each child's average grade across these three subject areas.

Results

Table 2 shows the product-moment correlations obtained between the children's performance on the PPSRT given either in pre-kindergarten (Samples 1, 2 and 3) or in kindergarten (Samples 4, 5 and 6) and the children's subsequent performance on these two sets of criteria (standardized test performance, classroom performance).[1] As can be seen from the findings reported in Table 2, the correlations obtained between the total number of form errors produced in pre-kindergarten or in kindergarten and the children's later performance on the six different standardized tests mentioned above extended from .40 (Sample 2: Woodcock Reading Mastery Test, N = 40, p = .001) through .79 (Sample 5: Wide Range Achievement Test, N = 132, p = .001). Very similar findings are evident in the case of the second set of criteria dealing with the children's subsequent classroom work where the correlations typically ranged in the vicinity of .50 (p = .001).[2] Moreover, based on the three independent samples of children that were given this same printing task twice, either four or eight months apart (see the Subjects section above), we obtained test-retest reliability correlations of .83 (N = 24, p < .001), .73 (N = 110, p < .001), and .74 (N = 105, p < .001), respectively, between the total number of form errors produced during the first and the second test session. Considered together, the evidence from this follow-up work demonstrates that scores on the PPSRT at the preschool level are quite closely tied to later school achievement across the curriculum and, furthermore, that preschool children who perform either very poorly or very well on this test on one occasion are likely to behave in an extremely similar fashion when tested again even up to half a year later.

PLACE TABLE 2 ABOUT HERE

Through a further analysis of the data we also found that the PPSRT can be employed with reasonable accuracy in identifying individual children who are likely to experience later school failure. First, following the general guidelines suggested by Lichtenstein (1981) as well as Keogh & Daley (1983), the children were divided into two categories based on the teacher's end-of-year promotion decisions. Those children said to be 'at-risk for failure', either were not promoted or, if promoted, they were placed in a slower or junior section of the next grade. For the most part these were the children who received D-, D, or D+ ratings on the 12 point scale mentioned above. The other category, labeled 'fully ready for promotion', refers to children who obtained an overall rating of B- to A+ on this same scale. This label was used because these ratings were only awarded to children who were not experiencing major problems in any of the main academic areas covered in the primary grades. It is important to note, however, that in all cases only the most recently available information was used in determining which of the two categories best described a given child. That is to say, grade 2 information was employed for those children whom we were able to follow through this level. In the case of other children, even in the same sample, it was sometimes necessary to employ either grade 1, kindergarten, or even pre-kindergarten information depending on when the children were lost from the sample.

Next, cutoff points for school readiness on the PPSRT were determined following Simner's (1982) procedure. For children tested in the spring of pre-kindergarten the cutoff point was set at a form error score of 22, for children tested in the fall of kindergarten the score was set at 17, and for children who were tested in the spring of kindergarten the score employed was 6. Tables 3, 4, and 5 show the number and percentage (in brackets) of children in the at-risk as well as in the fully-ready category for whom either true or false positive as well as true or false negative judgements occurred using these cutoff points. As the findings in these three tables indicate, with these cutoff points we were able to identify correctly about 75% of all of the at-risk children (true positives) in Samples 1 through 6 while at the same time achieving an overall classification hit rate (total number of true positives + total number of true negatives/total number of children for whom predictions were made) in the vicinity of 80%.

PLACE TABLES 3, 4, AND 5 ABOUT HERE

Finally, the information in Table 6 supplements the results in Tables 3, 4, and 5 by showing the approximate odds of being at-risk for school failure as opposed to being fully-ready for school entry for various ranges of scores both above and below these cutoff points. To arrive at the probability figures (or odds) in Table 6 we used a procedure described in Stanley (1965, pp. 101-102). This involved first determining the number of children in the at-risk as well as in the fully-ready category whose form error scores fell within the ranges shown in Table 6. Next, the odds of being at-risk as opposed to being fully-ready were obtained by calculating the ratio of these two numbers. The evidence in Table 6 clearly indicates that, as the total number of form errors obtained by any given child approaches the maximum of 41, the odds of that child actually being at-risk instead of being fully-ready for school, increases substantially.

PLACE TABLE 6 ABOUT HERE

Discussion

In summary, the overall results from this longitudinal investigation show that the PPSRT can be reliably scored, that it generates performance at the preschool level which remains quite stable over a fairly long period of time, and that this preschool performance is closely tied to later achievement in each of the major areas of the elementary school curriculum. Therefore, to the extent that correct early identification of the at-risk preschool child is important for the prevention of early school failure as many have argued (Reynolds & Clark, 1983), it would certainly seem that form errors in printing at the preschool level as measured by this test, can offer a useful source of additional information to educators and psychologists when they must decide which preschool children require special academic assistance. Before employing the PPSRT for this purpose though it would seem important to ask why form errors occur and also to consider the nature of the assistance that should be given to children who

produce an excessive number of these errors if these children are to avoid school failure.

By way of explanation, one account that readily comes to mind is that form errors could stem from perceptual problems, motor problems, or perceptual/motor integration problems. The reason for suggesting this account is the striking similarity between these errors and other drawing errors that, in the past, typically have been attributed to perceptual/motor difficulties (see, for example, Berry & Buktenica, 1967; Koppitz, 1963). If this account is correct, it would then seem reasonable to recommend placing children who make a large number of form errors in intervention programs like the ones developed by Barsch, Getman, Frostig, Kephart and others which emphasize early perceptual/motor training. This recommendation, of course, is based on the fact that programs like these are often suggested as being the most appropriate way of reducing the likelihood of later school failure for children who suffer from perceptual/motor problems (Hammill & Bartel, 1975).

Prior to accepting this account or making this recommendation, however, there are three additional findings that should be considered. First, we reported elsewhere (Simner, 1979) that form errors are far more common when kindergarten children print from memory immediately after seeing pictures of letters and numbers than when they print while looking directly at these pictures. Second, in this same study we also found that merely focusing the kindergarten child's attention on the printing task itself, without providing the child with any practice in letter or number formation, produces a marked reduction in the number of form errors. Third, in a more recent study we asked 22 pre-kindergarten children to copy as well as to trace nine model letters and numbers selected from among the 41 letters and numbers used in the PPSRT. Under the copy condition the procedure that we employed was identical to the one described in the Method section above. Under the trace condition each letter/number (presented one at a time as in the copy condition) appeared beneath a plain white sheet of paper. Here the child was asked to print directly over the letter as seen through the paper. Both conditions were administered to each child in the spring semester of pre-kindergarten using a counterbalanced order. As in the previous study, here too the children were given no opportunity to practice printing before testing commenced.

The outcome of this more recent work demonstrated quite clearly that whether or not form errors occur depends to a considerable extent on the nature of the printing task itself. Specifically, the number of form errors produced under the trace condition ($M = 2.3$) was significantly less than the number produced under the copy condition ($M = 6.4$, $t(21) = 7.41$, $p < .001$). Figure 3 provides a graphic illustration of this finding by showing the nine model letters and numbers the children were asked to reproduce along with sets of protocols from three of the children who took part in this study. By comparing the reproductions generated under both the trace and the copy condition against the model letters and numbers in Figure 3, it can easily be seen that when the children traced, the overall quality of their printing was indeed substantially better.

PLACE FIGURE 3 ABOUT HERE

In light of this additional evidence we believe there is good reason to question whether in fact form errors do stem from perceptual/motor difficulties. That is, do form errors result because children are unable to see letters as they actually appear (which would indicate a perceptual problem)? Do they occur because children cannot execute the fine muscle movements required to reproduce letters (which would indicate a motor problem)? Or do they stem from children's inability to combine the visual information they receive from the letters with the motor output needed to make a correct reproduction of the letters (which would indicate a visual/motor integration problem)? Presumably, if any one or even some combination of these three factors were valid, we should not have obtained the findings summarized above since it is not clear how the various manipulations employed in the foregoing studies could have corrected problems of this nature. In short, because the outcome of this work casts some doubt on the assumption that form errors result from perceptual/motor difficulties, we feel that it might not be beneficial to place children who make these errors in perceptual/motor training programs.

If form errors do not result from perceptual/motor problems, what then could be responsible for their occurrence and how should we help children who frequently make these errors? As an alternative account we previously suggested that form errors in printing might be due to the combined effects of momentary lapses in the child's attention to detail and to the child's lack of familiarity with letters and numbers (Simner, 1982). Since there is a considerable body of evidence linking these two characteristics by themselves to later poor performance in school (Simner, 1982; 1983), we then proposed that to avoid school failure, the at-risk preschool children who produce an excessive number of form errors might profit from being in a highly structured compensatory education program. That is, a program which would focus and maintain their attention while at the same time providing them with increased drill in language-based materials. Indeed, there is also evidence which shows that programs like this can be quite effective in reducing the odds of school failure among children who display characteristics that are typical of children who produce many form errors (Becker & Gersten, 1982; Rhine, 1981). Therefore, rather than assign children whose scores exceed the cutoff point on the PPSRT to perceptual/motor training programs, it would seem reasonable to us to recommend instead, that these children should be placed in programs like the one described in Becker and Gesten, since programs of this type are likely to be much more suitable in meeting the particular needs of the at-risk children who are identified through use of this new printing test.

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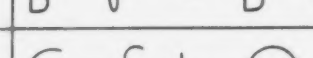
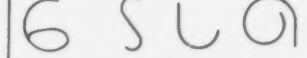
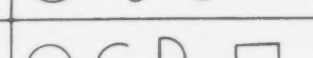
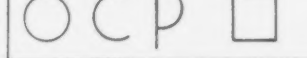
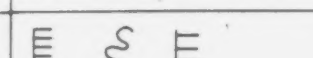
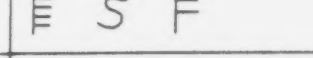
Letter	FORM ERRORS
B	
C	
D	
E	
F	
G	
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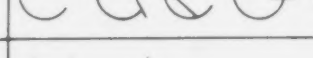
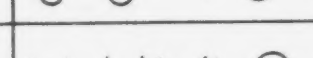
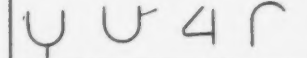
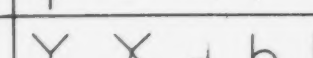
N	

Letter Number	FORM ERRORS
5	
4	
7	
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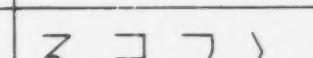
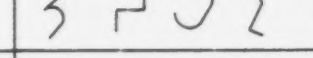
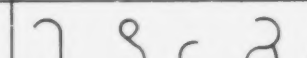
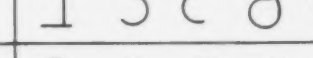
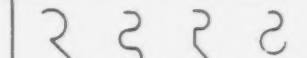
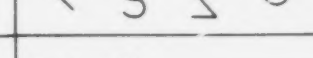
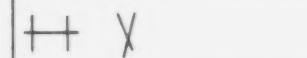
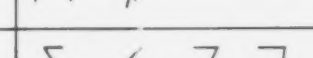
5	
4	
3	
2	
Z	
Y	
U	
S	

Figure 1. Examples of form errors in children's printing (from Simner, 1982, reproduced with permission granted by the Editor-in-Chief of the Journal of Learning Disabilities).

Figure 2. Location of the spiral binder, tester, and child during administration of the Printing Performance School Readiness Test.

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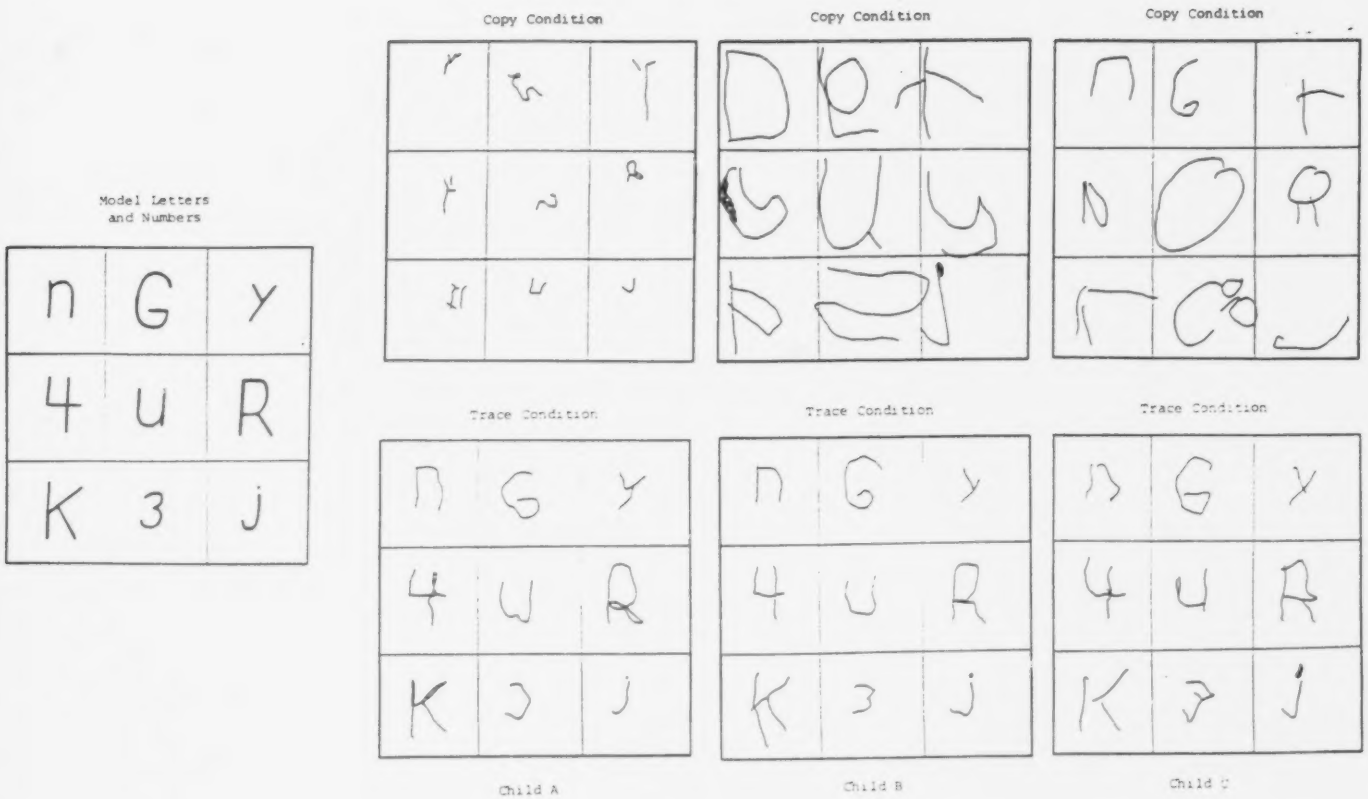

Figure 3. The nine model letters and numbers used in the copy/trace study and the reproductions of these same letters and numbers made by three pre-kindergarten children tested under both the copying and tracing conditions in this study.

Table 1. Interscorer reliability matrix showing the product-moment correlations based on results from 15 independent scorers each of whom scored the same 20 protocols obtained from the Printing Performance School Readiness Test.

		Scorer														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	1	-	.93	.96	.96	.97	.95	.94	.93	.97	.97	.93	.96	.95	.96	.97
	2		-	.90	.87	.93	.91	.92	.93	.93	.90	.88	.89	.86	.90	.89
	3			-	.97	.95	.96	.96	.94	.97	.98	.97	.95	.97	.97	.97
	4				-	.94	.96	.96	.94	.95	.98	.97	.96	.98	.98	.98
	5					-	.94	.94	.92	.95	.96	.94	.95	.92	.95	.95
	6						-	.93	.96	.95	.95	.94	.96	.96	.97	.95
Scorer	7							-	.96	.93	.95	.97	.93	.93	.95	.94
	8								-	.91	.92	.94	.91	.92	.95	.91
	9									-	.97	.95	.95	.94	.94	.97
	10										-	.96	.94	.96	.97	.98
	11											-	.94	.96	.95	.96
	12												-	.96	.96	.97
	13													-	.98	.97
	14														-	.96
	15															-

Table 2. Product-moment correlations between subsequent performance in school and scores on the Printing Performance School Readiness Test administered in pre-kindergarten (Samples 1, 2, and 3) or in kindergarten (Samples 4, 5, and 6).

		STANDARDIZED TEST PERFORMANCE								ACADEMIC PERFORMANCE IN SCHOOL										
		PRE-K		KINDERGARTEN			1st GRADE			END-OF-YEAR OVERALL IN-CLASS PERFORMANCE				END-OF-YEAR REPORT CARD MARKS						
														1st GRADE			2nd GRADE			
		DTKR	WRAT	DTKR	MRT	WRAT	MAT	WRMT	KDAT	PRE-KINDERGARTEN	KINDERGARTEN	1st GRADE	2nd GRADE	READING	WRITTEN COMPREHENSION	ARITHMETIC	READING	WRITTEN COMPREHENSION	ARITHMETIC
SAMPLE 1	SPRING OF PRE-K (N=81)									*** .50 (N= 80)	*** .60 (N= 70)	*** .51 (N= 65)	** .36 (N= 52)	*** .47 (N= 65)	*** .46 (N= 64)	*** .45 (N= 65)	** .38 (N= 52)	* .27 (N= 51)	** .37 (N= 52)
SAMPLE 2	SPRING OF PRE-K (N=69)		*** 76 (N= 62)			*** 67 (N= 60)		*** 40 (N= 40)	*** 60 (N= 40)	*** .43 (N= 69)	*** .48 (N= 60)	*** .54 (N= 51)		*** 56 (N= 51)	*** 55 (N= 50)	*** 43 (N= 51)			
SAMPLE 3	SPRING OF PRE-K (N=133)	*** 50 (N= 115)								*** .59 (N= 133)	*** .51 (N= 104)								
SAMPLE 4	FALL OF KINDER (N=118)				*** 58 (N= 22)		*** .74 (N= 20)	*** .50 (N= 88)	*** .57 (N= 84)		*** .54 (N= 118)	*** .60 (N= 98)	*** 51 (N= 87)	*** .53 (N= 98)	*** .48 (N= 89)	*** .54 (N= 98)	*** .50 (N= 87)	*** .42 (N= 85)	*** .39 (N= 87)
	SPRING OF KINDER (N=120)				*** .59 (N= 21)		*** 76 (N= 22)	*** .50 (N= 92)	*** .61 (N= 88)		*** .58 (N= 120)	*** .53 (N= 103)	*** .54 (N= 85)	*** .48 (N= 103)	*** .53 (N= 93)	*** .52 (N= 103)	*** .53 (N= 85)	*** .49 (N= 83)	*** .42 (N= 85)
SAMPLE 5	FALL OF KINDER (N=132)			*** 68 (N= 132)		*** .79 (N= 132)		*** .59 (N= 82)	*** .75 (N= 82)		*** 63 (N= 127)	*** .53 (N= 100)	*** .57 (N= 75)	*** .54 (N= 100)	*** .49 (N= 89)	*** .44 (N= 100)	*** .54 (N= 75)	*** .56 (N= 75)	*** 47 (N= 75)
	SPRING OF KINDER (N=111)			*** .44 (N= 106)		*** .72 (N= 102)		*** .53 (N= 80)	*** .71 (N= 80)		*** .47 (N= 111)	*** .49 (N= 93)	*** .45 (N= 66)	*** .51 (N= 93)	*** 49 (N= 82)	*** .43 (N= 93)	*** .37 (N= 66)	*** .45 (N= 66)	*** .42 (N= 66)
SAMPLE 6	FALL OR SPRING OF KINDER (N=95)										*** .59 (N= 89)	*** .54 (N= 76)	*** .46 (N= 57)	*** .50 (N= 76)	*** .51 (N= 69)	*** .48 (N= 76)	*** .51 (N= 57)	*** .41 (N= 56)	*** .41 (N= 56)

* p=.05
** p=.01
*** p=.001

Table 3. Prediction of teacher's end-of-year performance evaluations from PPSRT scores obtained in the late spring of pre-kindergarten (Samples 1, 2 and 3 combined).

	at-risk for failure	fully-ready for promotion
Poor Prognosis (score of 22 or more)	(true positive)	(false positive)
	39	20
	(67%)	(14%)
Good Prognosis (score less than 22)	(false negative)	(true negative)
	19	120
	(33%)	(86%)

Classification hit rate: true positive + true negative/total sample = 80%

Table 4. Prediction of teacher's end-of-year performance evaluations from PPSRT scores obtained in the fall of kindergarten (Samples 4, 5, and 6 combined).

	at-risk for failure	fully-ready for promotion
Poor Prognosis (score of 17 or more)	(true positives)	(false positives)
	57	33
	(86%)	(26%)
Good Prognosis (score less than 17)	(false negatives)	(true negatives)
	9	96
	(14%)	(74%)

Classification hit rate: true positives + true negatives/total sample = 78%

Table 5. Prediction of teacher's end-of-year performance evaluations from PPSRT scores obtained in the late spring of kindergarten (Samples 4, 5, and 6 combined).

	at-risk for failure	fully-ready for promotion
Poor Prognosis (score of 6 or more)	(true positives)	(false positives)
	62	38
	(90%)	(28%)
Good Prognosis (score less than 6)	(false negatives)	(true negatives)
	7	99
	(10%)	(72%)

Classification hit rate: true positives + true negatives/total sample = 78%

Table 6. Approximate odds of being at-risk for school failure as opposed to being fully ready for school entry for various score ranges on the PPSRT. The number of at-risk and fully ready children who obtained scores in these ranges is also shown below.

	PPSRT Score Range	Number of Children		Approximate Odds Of Being At-Risk
		At-Risk	Fully-Ready	
Late Spring of Pre-K	31 to 41	19	2	10:1
(Samples 1, 2, and	22 to 30	22	18	1:1
3 combined)	13 to 21	8	22	1:3
	0 to 12	9	98	1:10
Fall of Kindergarten	30 to 41	23	3	7:1
(Samples 4, 5, and	17 to 29	34	30	1:1
6 combined)	10 to 16	6	29	1:5
	0 to 9	3	67	1:22
Late Spring of	17 to 41	24	1	24:1
Kindergarten	6 to 16	38	37	1:1
(Samples 4, 5, and	3 to 5	6	56	1:10
6 combined)	0 to 2	1	43	1:43

Footnotes

[1] Separate findings for males and females are not reported in Table 2 because the correlations were quite similar for both sexes. For example, in the case of the males in Sample 5 who were tested in the spring of kindergarten, the scores obtained by these children on the PPSRT correlated .71 with their performance on the KDAT given in grade 1; for the females in this same sample the correlation between these two variables was .77.

[2] Aside from the fact that the correlations in this table replicate all of our previous findings on the predictive validity of form errors in printing (Simner, 1982), it is worth mentioning that these correlations are extremely similar to (and in some instances even exceed) the correlations that typically are reported for the more traditional and often far more time-consuming devices that are frequently used today for the purpose of identifying at-risk children. These include the McCarthy Scales of Children's Abilities, the Metropolitan Readiness Test, the Screening Test of Academic Readiness, the Wechsler Preschool and Primary Scale of Intelligence, the Slosson Intelligence Test, the Denver Developmental Screening Test, and the de Hirsch Predictive Index of Reading Failure, to name just a few (Feshback, Adelman, & Williamson, 1974; Flynn & Flynn, 1978; Lindquist, 1982; Massoth & Levenson, 1982; Serwer, Shapiro, & Shapiro, 1972; Teledgy, 1975).

[3] The minor discrepancies which appear in these three tables as well as in Table 6 and their counterparts shown in Simner (1985) resulted from the further updated information gathered on the children in Samples 2, 3, and 5.

[4] The work summarized in Hammill and Bartel (1975) also suggests that such placement might not be entirely appropriate since the overall effectiveness of these programs in reducing school failure has not been very promising.